Notes on the Mosquitoes on the River and Coast Districts of the Eastern Side of the Peninsula.

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The rivers on the eastern side of the watershed are comparatively free from mine tailings but in rainy weather are muddy to some extent. The Pahang River is the largest, but observations were also made on the Kuantan River. One point of resemblance to such African rivers as the Zambesi is that the common mosquitoes belong to the *Mansonia*. The commonest species however is not *uniformis* as on the Zambesi though it does occur but *annulipes* and a third species *M. annulata* is also found.

These mosquitoes were much less numerous than on an African river. *Stegomyia scutellaris* was common in some places and in the vicinity of large settlements only and therefore to be attributed to them *Culex fatigans*.

Anopheles were not found on the boat moored up to the banks during five nights spent on the Pahang River or in two on the Kuantan River and only in the lower reaches were any anopheles larvæ found in pools near the bank and none were found in the river or pools in connection with the river. This is in marked contrast with African rivers where such mosquitoes abound. Considering that several species of anophelina *A. Treacherii*, *A. albirostris*, *A. willmori* and *A. Karwari* are found in streams only and that at least two of these species are abundant in the streams supplying these rivers their absence in the rivers requires some explanation. In the water from the Kuantan the larvæ can live and probably also in long stretches of the Pahang River. The absence of any grass, reeds or sedges growing into or on the surface of the rivers is the probable explanation. Such grasses abound in the African rivers and the larvæ are found in the water between the stems and submerged roots. This form of vegetation prevents the larvæ from being carried away, protects them from fish and probably provides them with food supply.

It is of great importance that the importation of such grasses should be prevented. Malaria on the banks of rivers except towards their mouths is not common or virulent. In Africa such banks are on the East coast the worst placed for malaria. The introduction of grasses of this character might and probably would result in an enormous increase in the unhealthiness of a thickly populated portion of the country.

The common larvæ found in the pools were *C. gelidus*, *nigrocephalus* and *fatigans*. Near the coast the river broadens out and sand banks are numerous and there are backwaters. The numbers of mosquitoes is larger especially of those belonging to the genus Mansonia. No anopheles were found in the river and those found on shore are not river breeders. At the town of Pekan the anophelina *M. Rossi*, *C. Kochii*, *M. Sinensis* and *M. Umbrosus* were found as adults and breeding in pools and more or less stagnant water in and near the town. In this town the commonest mosquito was still *Mansonia* annulipes but *Culex fatigans* and *Stegomyia scutellaris* and *M. uniformis* were also common. *Culex gelidus* and *biauratus* were the commonest larvæ found in the open country whilst *Culex fatigans* was common nearer the more crowded portions of the town.

On the open flat land in the vicinity of the river pitcher plants were extremely common. The two species have been identified by Mr. RIDLEY, the Straits Government Botanist, as *Nepenthes Rafflesiana* and *N. gracilis*. In both larvæ were found in great abundance. These include a Teromyia *T. Ater* which like the larvæ of other members of the genus was larvivorous. The other larvæ found include a new species of *Colonemyia* and a *Skeiromyia fusca*. These appear to be carnivorous and to live on the bodies of the dead adult insects so abundantly found in these cups. These mosquitoes though of considerable interest are probably of little importance to man and do not in the adult stage attack him.

At Pekan itself there is comparatively little malaria though it does occur. An examination of 138 native children was made and only 7 had spleens definitely projecting below the ribs. Of children over 6 months but under 4 years out of 69 in 5 the edge was below that of the ribs but only in 3 more than a finger's breadth. Of 59 over 4 but under 10 in 2 only was the spleen definitely enlarged. In 4 others spleen could just be felt.

Along an African river, Zambesi or Shire, the proportion between 2 and 4 years of age with definitely enlarged spleen is about 50 per cent.

At the mouth of the river, Kuala Pahang, there are patches of mangrove and Nipah swamps though the greater part of the shore and the banks of the river are clear sand. There are also cocoanut plantations and ample cocoanuts shells abound. Few mosquitoes were found in the house at the point. Those found were *Stegomyia Scutellaris* and *Mansonia uniformis* and no anopheles. In the empty cocoanut shells and other receptacles larvæ were not as frequently met with as is usual in such places. The larvæ found were those of *Culex maculicrura*, *C. graminis* and *Stegomyia Scutellaris*.

In the crab holes no larvæ and no mosquitoes were found. On entering the mangrove swamp abundant mosquitoes were found. These bite viciously in the day time but remain in shelter and neither enter the houses nor come out into the open. *Verralina Butleri* and *Stegomyia fusca* were the species represented.

The Kuantan River opens into the sea some twenty miles north of the Pahang River. It opens into a bay formed by a promontory of granite jutting out into the sea and a range of granite hills runs nearly parallel to the general direction of the river to the north having a belt of flat sandy soil from one to two miles in breadth between it and the river. Observations were made on each side of the mouth of the river, in the town Kuala Kuantan, and at various places on the range of hills mentioned.

There was excessive rain during the period under review and consequently the flat land was so flooded that little information could be gained as to the more permanent breeding places.

The mosquitoes found in the houses were *Stegomyia scutellaris*, *Mansonia uniformis* and *annulipes* and *Culex fatigans*. No anopheles were seen and no *Stegomyia fasciata*.

In breeding places in the town larvæ of *Stegomyia scutellaris* and *Culex fatigans* were found and in the neighbourhood pitcher plants of the same two species as were found near Pekan and these also contained larvæ of the same mosquitoes. In the mangrove swamps which are more extensive than on the Pahang River *Verralina, Butleri* and *Stegomyia fusca* were found. There is little malaria in the town or in the houses on either side of the river bank but near the range of granite hills settlements have been made and have proved to be most unhealthy. These hills are thickly covered with forest and streams are numerous. In this jungle in every place *Stegomyia scutellaris* were abundant and in certain spots *M. Umbrosus* was found in numbers. This mosquito was also found by Dr. LEICESTER outside the drained area at Klang but has not been met with in the interior. In the streams in this jungle *Anopheles treacherii* were found. Near one of the abandoned stations and within thirty yards of the sea *Anopheles treacherii* were found in the stream and also *Cellia Kochii* and *A. sinensis* in a pool. In bottles, empty tins and other artificial receptacles about the camp very numerous larvæ were found and these include *Stegomyia scutellaris, Desvoidea obturbans.*

During two nights spent on the river then in flood at points some 20 and 40 miles from the mouth only *Mansonia annulipes, M. annulata* and *Tæniorhynchus conopas* were caught.

Higher up at Sungei Lumbing a sufficiently long stay was made for a closer investigation. The river when the flood subsided was quite clear and though a rapid running stream there were plenty of places where quiescent areas were to be met with but no grass growing into the stream. No anopheles larvæ were found in the river and whilst living on the banks of the river no anopheles were seen in the house or other buildings. The river runs through a valley bounded on the south by a range of so-called slate, Andalusite schist. The streams from this slate were not numerous and no anopheles were found in them whilst passing over the rocky bed. Near the valley the streams passed through earth and formed pools, in some such places *C. Kochii* were found in large numbers. In most of the streams on this side no anophelina were found. On the other, the northern, side of the valley the hills were granite and in the streams on this side *A. treacherii* were readily found and lower down the streams *C. Kochii* were found abundantly.

On this, the granite, side anopheles were abundant.

Malaria is rare amongst those working at the settlement of the Pahang Corporation which is on the flat on the slate side of the river but does occur. On the other side, the granite side, it is very common and often severe amongst the woodcutters who live near the foot of the hills more especially so in those living near the granite hills.

In the pools in and around the township and various kongsis *Stegomyia scutellaris* was the abundant mosquito but *Culex fatigans* was fairly common. Other mosquitoes include *C. gelidus, C. mimeticus, C. vagans, C. sitiens, C. impellens, C. hirsutipalpis* and *C. concolor Uranotania trilineata* and *fusca*. In artificial receptacles *Stegomyia scutellaris* was again the commonest, *Stegomyia fasciata, Desvoidea aurolineata, obturbans* and *jugraensis* were also found. In one tub seven larvæ of *Teromyia quasiferox* were found. Two species of *Lophoceratomyia*, *L. pallidus* and Mammilifer and Taeniorhynchus *domestica* and *conopas*.

Much of the ground round the houses and settlement is overgrown with long grass or low scrub. Into this thick growth innumerable tins, bottles and other artificial receptacles have been thrown and it is to this accumulation of rubbish which affords suitable breeding places for mosquitoes that the prevalence near such land of mosquitoes is to be attributed.

The presence of *Stegomyia fasciata* the carrier of yellow fever so far inland is exceptional in this country and is the more remarkable that no specimens of this mosquito were found on the coast.

As compared with the West Coast of the Malay Peninsula there are certain points of resemblance. *Verralina Butleri* and *Stegomyia fusca* have been found only on the East and West Coast and the same may be said for *Myzorhynchus umbrosus*.

Most of the other mosquitoes are found on the East Coast but are widely distributed and occur inland as well as on the coast. Of these *Culex fatigans*, *Stegomyia scutellaris* the three species of *Mansonia*, the three *Desvoidea*, the two *Taeniorhynchi*, the two Lophoceratomyiæ, *Teromyia quasiferox* the two Uranotæni are examples. *Stegomyia fasciata* occurs in Singapore but only in a few places on the Western coast as at Port Swettenham, Penang, etc.

As regards the mosquitoes themselves some of the species represented have only been occasionally found elsewhere these include *Mansonia annulatus*, *Culex hirsutipalpis ; Desvoidea aurolineata*, *Taeniorhynchus conopas*, *Lophoceratomyia mammilifer*. *Uranotaenia fusca* is a new species but closely allied to *U. inornata*. Certain mosquitoes showed some variation from the type particularly *Cellia Kochii* (*vide* Dr. LEICESTER's description). Of the pitcher plant mosquitoes the Teromyia appears to be a new species but the male resembles *T. funessus*. It is described below as *Teromyia Ater* nov. sp.

The *Colonomyia* is only definitely separated on account of the marked difference in the larvæ and pupa from *C. Caerulocephala*. There are three varieties but the differences, merely of colour, are so slight that it is doubtful if they are distinct species. It is described below as *Colonomyia Mendacis*.

Teromyia Ater.—As seen by the naked eye appears to be almost black in ordinary light with black caudal tufts. When brightly illuminated is metallic colouring seen green on the thorax and purple on the appendages.

Female Head.—Thickly clad with scales black but when brilliantly illuminated green and yellow. Eyes black.

Antennæ.—Basal joint black but covered with white scales. *Clypeus* black. *Proboscis* and *palpi* black but when brilliantly illuminated showing brilliant purple reflections.

Thorax.—Black covered with broad lanceolate scales showing yellow-green reflections. Pleura black with patches of silvery-white scales. Prothoracic lobes covered thickly with white scales. Legs purple-black. Under surface of femora white. Lighter broad bands on tibia and metatarsus of middle legs. Scutellum covered with dark scales with greenish-yellow reflections.

Abdomen.—Dorsal surface dark purple. Venter white scaled. Lateral hairs white. These are longer on the sixth segment and continuous with the caudal tufts of long dark brown hairs on the seventh and eighth segments.

Male.—Antennæ densely plumose. Scales on basal joint scanty black and white. Scales on second joint long and narrow and overlapping the base of the third joint. Proboscis black with purple reflections and so are the palpi which are not banded but show a lighter purple patch about the bend. No banding of the legs. Caudal tuft more conspicuous than in the female and arises from the seventh and eighth segment.

Remarks.—The male closely resembles *T. funestus* in its general aspect but differs in that the palpi are much longer and that the last joint of the palpi is nearly twice as long as the penultimate. The antennæ also are longer and the second joint is longer than the third. The basal joint has scales which that of *T. funestus* has not The caudal tufts from the ninth joint is absent in *M. ater*. The female of *T. funestus* is not known and only a single male has been observed.

Occurrence.—Larvæ were found in pitcher plants as *Nepenthes Rafflesiana* on the East Coast Pahang. The caudal flaps of the pupa are rounded but less so than *T. quasiferox*. The respiratory tubes are short and square cut.

COLONEMYIA MENDACIS.—NOV. SP.

Head clad with flat scales, white laterally and behind eyes black elsewhere. In certain lights the head appears brilliantly blue. Upright dark brown fork scales posteriorly. Antennæ dark brown; plumose in the male. Palpi four-jointed terminal joint nipple-shaped covered with purple-black imbricated flat scales. Proboscis long black and curved.

Thorax.—Prothoracic lobes prominent bright yellow with yellow hairs and square-ended broad nearly black scales

Mesothorax.—Bright yellow covered with narrow curved scales black in the middle and yellow and black at the sides but different specimens show much variation in the distribution of the yellow and dark scales. The black scales at the sides arranged in small tufts. Basal white transparent scales in pleura.

Wing.—First fork cell longer than second. Vein scales black small square-ended centrally and a few lateral curved narrow scales with square ends. Scutellum distinctly trilobed four brown bristles central lobe and three each lateral one. A patch of broad square-ended brown scales in centre of each lobe much larger in middle lobe.

Legs.—Femora covered with black scales except for the large round patches covered with white scales present in all the members of this genus. Remainder of legs covered with purple-bronze scales slightly lighter in colour at the tarsal joints. Ungues equal not serrate in female. In male abdomen dorsally covered with brown-bronze scales mixed on last segment with bright blue scales. Laterally patches of bright white scales on all segments. Venter yellow covered with golden-yellow scales.

Varieties.—The variation in the thoracic scales has been mentioned but the colour of the thorax of the clypeus and basal joint of the antennæ vary. In a few specimens the mesothorax is almost black except for a yellow edge in front and the scales appear to be golden. In some of these the clypeus and basal joint of antennæ are yellow. In others and also in some specimens with the thorax yellow the clypeus and basal joints of antennæ are ashy-grey.

Occurrence.—Larvæ found in pitcher plants on the East Coast.

Remarks.—The larvæ of *Colonemyia cæurulocephala* have a long narrow curved respiratory siphon these mosquitoes have a short broad and straight one. The pupa of *Colonemyia cærulocephala* have long curved thin respiratory tubes with an expanded end. These pupa have short and thick respiratory tubes. It is on account of this marked difference in the larvæ and pupa that the specific distinction rests. The bright yellow clypeus and basal joint of the antennæ are not met with in *C. cærulocephala* but are also not found in those specimens described as varieties. The specimens of *C. mendacis* are larger than those of *C. cærulocephala*.